FINAL REPORT
SEPTEMBER 1991

REPORT NO. EVT 35-90

ROAD TEST OF H1572 KIT FOR 155MM PROJECTILE (M753 SYSTEM)

Prepared for:
U.S. Army Armament, Munitions
and Chemical Command
ATTN: AMSMC-TMD
Rock Island, IL 61299-6000

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SAVANNA, ILLINOIS 61074-9639

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REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

EPORT SECURITY CLASSIFICATION
UNCLASSIFIED

1b. RESTRICTIVE MARKINGS

ECURITY CLASSIFICATION AUTHORITY

ECLASSIFICATION / DOWNGRADING SCHEDULE

3. DISTRIBUTION / AVAILABILITY OF REPORT
UNLIMITED

RFORMING ORGANIZATION REPORT NUMBER(S)
EVT 35-90

5. MONITORING ORGANIZATION REPORT NUMBER(S)

AME OF PERFORMING ORGANIZATION
U.S. Army Defense Ammunition Center and School

6b. OFFICE SYMBOL (if applicable)
SMCAC-DEV

7a. NAME OF MONITORING ORGANIZATION

DDRESS (City, State, and ZIP Code)
ATTN: SMCAC-DEV
Savanna, IL 61074-9639

7b. ADDRESS (City, State, and ZIP Code)

AME OF FUNDING / SPONSORING RGANIZATION
U.S. Army Armament, Munitions and Chemical Command

8b. OFFICE SYMBOL (if applicable)
AMSMC-TMD

9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER

DDRESS (City, State, and ZIP Code)
ATTN: AMSMC-TMD
Rock Island, IL 61299-6000

10. SOURCE OF FUNDING NUMBERS

PROGRAM ELEMENT NO.	PROJECT NO.	TASK NO.	WORK UNIT ACCESSION NO.

TLE (Include Security Classification)
Road Test of H1572 Kit for 155mm Projectile (M753 System)

ERSONAL AUTHOR(S)
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TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT (Year, Month, Day)	15. PAGE COUNT
Final	FROM ____ TO ____	1991 September	

UPPLEMENTARY NOTATION

COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	

BSTRACT (Continue on reverse if necessary and identify by block number)

The U.S. Army Defense Ammunition Center and School (USADACS), Validation Engineering Division (SMCAC-DEV), was tasked by the U.S. Army Armament, Munitions and Chemical Command (AMCCOM), AMSMC-TMD, to conduct the necessary transportability tests to develop tiedown procedures securing the H1572 kit, package 2 of 2 for the M753 projectile, in the 2 1/2-ton cargo truck and 22 1/2-ton M871 semitrailer. The H1572 kit was secured in each vehicle in three separate configurations and then tested over the USADACS road hazard course. The configurations consisted of a longitudinal position secured with two 5,000-pound web straps, a lateral position secured with two 5,000-pound web straps, and a lateral position secured with one 5,000-pound web strap. Results from the road hazard testing indicated that the two web straps were sufficient to hold the H1572 kit in the longitudinal orientation, and one web strap was sufficient to hold the H1572 kit in the lateral orientation.

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21. ABSTRACT SECURITY CLASSIFICATION
UNCLASSIFIED

NAME OF RESPONSIBLE INDIVIDUAL	22b. TELEPHONE (Include Area Code)	22c. OFFICE SYMBOL
JEROME H. KROHN	815-273-8929	SMCAC-DEV

Form 1473, Jun 86 — Previous editions are obsolete

U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL
VALIDATION ENGINEERING DIVISION
SAVANNA, IL 61074-9639

REPORT NUMBER EVT 35-90
ROAD TEST OF H1572 KIT FOR 155MM PROJECTILE (M753 SYSTEM)

TABLE OF CONTENTS

PART 1

INTRODUCTION

A. BACKGROUND:

1. The U.S. Army Defense Ammunition Center and School (USADACS), SMCAC- DEV, was tasked by the U.S. Army Armament, Munitions and Chemical Command (AMCCOM), AMSMC-TMD, to conduct the necessary transportability tests to develop tiedown procedures securing the H1572 kit, package 2 of 2 for the M753 projectile, in the 2 1/2-ton cargo truck and 22 1/2-ton M871 semitrailer. Each vehicle was driven over the USADACS road hazard course while loaded with the H1572 kit.

2. The H1572 kit was instrumented with eight accelerometers. One triaxial group of accelerometers was located on the center of the simulated mass, a second triaxial group of accelerometers was located at the aft end of the kit on the control panel, and a biaxial group of accelerometers was located in the middle of the kit on the control panel. The triaxial accelerometers were measuring longitudinal, vertical, and lateral accelerations relative to the kit's longitudinal axis. The biaxial accelerometer was measuring lateral and vertical accelerations relative to the kit's longitudinal axis (see drawing). Also, a triaxial accelerometer was located on the bed of each vehicle.

B. AUTHORITY. The test was accomplished IAW mission responsibilities delegated by AMCCOM. Reference is made to the following:

1. Change 4, 4 October 1974, to AR 740-1, 23 April 1973, Storage and Supply Activity Operation.

2. AMCCOM-R 10-17, Mission and Major Functions of USADACS, 13 January 1986.

3. Message, AMCCOM, AMSMC-MAY-WA(D), 121600Z Sep 90, subject: Transportation Test of Package 2 of 2 for M753 Projectile.

C. OBJECTIVE. The objective of this test was to develop/evaluate tiedown procedures for the H1572 kit on the cited vehicles.

D. CONCLUSIONS:

1. Two 5,000-pound capacity web strap tiedown assemblies over the top of the kit were sufficient to restrain the kit in the longitudinal orientation in every test.

2. One 5,000-pound capacity web strap tiedown assembly over the top of the kit was sufficient to restrain the kit in the lateral orientation in every test.

E. RECOMMENDATION. As tested, the tiedown procedures for package 2 of 2 for the M753 projectile are acceptable for on/off highway transportation in/on tactical vehicles.

PART 2

25 - 27 September 1990

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PART 3

TEST PROCEDURES

Five separate road testing steps were required as identified herein:

A. Step 1: This step provided for the specimen to be driven over a 200-foot-long segment of concrete-paved road which consisted of two series of railroad ties projecting 6 inches above the level of the road surface. This hazard course was traversed two times and repeated per step no. 4.

1. The first series of ties was spaced on 8-foot centers and alternately positioned on opposite sides of the road centerline for a distance of 50 feet.

2. Following the first series of ties, a paved roadway of 75 feet separated the first and second series of railroad ties.

3. The second series of ties was alternately positioned similarly to the first, but spaced on 10-foot centers for a distance of 50 feet.

4. The specimen load was driven across the hazard course at speeds that produced the most violent vertical and side-to-side rolling reaction obtainable in traversing the hazard course (approximately 5 miles per hour [mph]).

B. Step 2: This step consisted of 30 miles of travel over available rough roads consisting of gravel, concrete and asphalt, curves, cattle gates, and stops and starts.

C. Step 3: This step provided for the specimen load to be subjected to three full air brake stops while traveling in the forward direction and one in the reverse direction while traveling down a

7 percent grade. The first three stops were at speeds of 5, 10, and 15 mph, while the stop in the reverse direction was at approximately 5 mph.

D. Step 4: This step consisted of a repeat of that identified in step no. 1.

E. Step 5: This step provided for the specimen load to be driven over a 300-foot-long segment of concrete-paved road which had rails spaced on 26 1/2-inch centers and protruded 2 inches above the road surface. The specimen load was driven at the speed which produced the most violent response.

Note, Steps nos. 3 and 5 may be deleted at the discretion of the test conductor.

F. Inspections and data collection. At selected intervals during testing, thorough inspections of the specimen loads were made by technically proficient personnel to collect data on the specimen load and equipment resulting from above load test steps. This data are recorded in part 4, following.

PART 4

TEST DATA AND RESULTS

A. Pretest Determinations:

1. The H1572 kit, package 2 of 2 for the M753 projectile, was shipped via Emery Worldwide from Lawrence Livermore National Laboratories, Livermore, CA, to USADACS. Upon arrival, the H1572 kit was inspected and found to be in good condition.

2. After inspection, the kit was partially disassembled and the instrumentation installed. One triaxial accelerometer block was installed on the kit's simulated mass, one triaxial accelerometer block was located on the aft end of the kit on the control deck, and one biaxial accelerometer block was mounted near the middle of the kit on the control deck (see drawing).

B. Synopsis of Test 1:

1. The H1572 kit was positioned with the long dimension parallel to the long dimension of the bed of the 2 1/2-ton cargo truck. The kit was loaded near the rear of the truck and secured with two web strap tiedown assemblies over the top of the container.

2. No movement was noted during the transportability testing of the longitudinal orientation of the H1572 kit on the 2 1/2-ton cargo truck. This tiedown method was approved for on/off highway movement of the H1572 kit, package 2 of 2 for the M753 projectile.

Road Test Data for Test 1:

Date: 25 September 1990

Test Specimen: The H1572 kit was positioned with the long dimension parallel to the long dimension of the 2 1/2-ton cargo truck and secured with two web strap tiedown assemblies.

Pass 1, Course A: 6.00 SEC 5.68 MPH
Pass 1, Course B: 6.46 SEC 5.28 MPH

Remarks: No movement.

Pass 2, Course A: 6.00 SEC 5.68 MPH
Pass 2, Course B: 6.00 SEC 5.68 MPH

Remarks: No movement.

30-Mile Road Test: No movement.

Panic Stops: No movement.

Pass 3, Course A: 5.53 SEC 6.15 MPH
Pass 3, Course B: 6.46 SEC 5.27 MPH

Remarks: No movement.

Pass 4, Course A: 5.53 SEC 6.15 MPH
Pass 4, Course B: 5.53 SEC 6.15 MPH

Remarks: No movement.

Washboard Course: No movement.

C. Synopsis of Test 2:

1. The H1572 kit was positioned with the long dimension perpendicular to the long dimension of the 2 1/2-ton cargo truck's bed. The kit was loaded near the rear of the truck and secured with one web strap tiedown assembly over the top of the container.

2. As a result of transportability testing, displacement of the H1572 kit from its original starting point was a maximum of 2 1/2 inches during the test. The web strap remained taught throughout the test. This tiedown method was approved for on/off highway movement of the H1572 kit, package 2 of 2, for the M753 projectile.

Road Test Data for Test 2:

Dates: 25 - 26 September 1990

Test Specimen: The H1572 kit was positioned with the long dimension perpendicular to the long dimension of the 2 1/2-ton cargo truck and secured with one web strap tiedown assembly.

Pass 1, Course A: 5.53 SEC 6.15 MPH
Pass 1, Course B: 5.53 SEC 6.15 MPH

Remarks: Left side shifted forward 1 inch.

Pass 2, Course A: 5.53 SEC 6.15 MPH
Pass 2, Course B: 5.53 SEC 5.15 MPH

Remarks: No additional movement.

30-Mile Road Test: Left side shifted forward 3/4-inch.
Right side shifted forward 1/4-inch.

Panic Stops:

5 MPH: Left side shifted forward 1/4-inch.
Right side shifted forward 1/4-inch.

10 MPH:Left side shifted rearward 1/4-inch.

15 MPH: No additional movement.

5 MPH Reverse: No additional movement.

Pass 3, Course A: 4.61 SEC 7.38 MPH
Pass 3, Course B: 5.07 SEC 6.71 MPH

Remarks: Left side shifted forward 3/8-inch.
Shifted right 1 inch.

Pass 4, Course A: 4.61 SEC 7.38 MPH
Pass 4, Course B: 5.07 SEC 6.71 MPH

Remarks: Left side shifted rearward 1/8-inch.
Shifted right 1/4-inch.

Washboard Course: Left side shifted forward 1/2-inch.
Shifted right 1/4-inch.

D. Synopsis of Test 3:

1. The H1572 kit was positioned with the long dimension perpendicular to the long dimension of the 2 1/2-ton cargo truck's bed. The kit was loaded near the rear of the truck and secured with two web strap tiedown assemblies crossed over the top of the container.

2. No movement was noted, as a result of the transportability test of the H1572 kit in lateral orientation, on the 2 1/2-ton cargo truck. This tiedown method was approved for on/off highway movement of the H1572 kit, package 2 of 2 for the M753 projectile.

Road Test Data for Test 3:

Date: 26 September 1990

Test Specimen: The H1572 kit was positioned with the long dimension perpendicular to the long dimension of the 2 1/2-ton cargo truck and secured with two web strap tiedown assemblies crossed over the top of the container.

Pass 1, Course A: 5.07 SEC 6.71 MPH
Pass 1, Course B: 5.53 SEC 6.15 MPH

Remarks: No movement.

Pass 2, Course A: 4.61 SEC 7.38 MPH
Pass 2, Course B: 5.53 SEC 6.15 MPH

Remarks: No movement.

30-Mile Road Test: No movement.

Panic Stops: No movement.

Pass 3, Course A: 5.53 SEC 6.15 MPH
Pass 3, Course B: 5.07 SEC 6.71 MPH

Remarks: No movement.

Pass 4, Course A: 5.53 SEC 6.15 MPH
Pass 4, Course B: 6.00 SEC 5.68 MPH

Remarks: No movement.

Washboard Course: No movement.

E. Synopsis of Test 4:

1. The H1572 kit was positioned with the long dimension parallel to the long dimension of the 22 1/2-ton M871 semitrailer. The kit was loaded near the rear of the truck and secured with two web strap tiedown assemblies over the top of the container.

2. Displacement of the H1572 kit from its original starting point, as a result of the transportability testing, was a 3/8-inch maximum during the test. This tiedown method is approved for on/off highway movement of the H1572 kit, package 2 of 2 for the M753 projectile.

Road Test Data for Test 4:

Date: 27 September 1990

Test Specimen: The H1572 kit was positioned with the long dimension parallel to the long dimension of the 22 1/2-ton M871 semitrailer and secured with two web strap tiedown assemblies.

Pass 1, Course A: 7.20 SEC 4.73 MPH
Pass 1, Course B: 6.60 SEC 5.16 MPH

Remarks: No movement.

Pass 2, Course A: 6.00 SEC 5.68 MPH
Pass 2, Course B: 6.66 SEC 5.16 MPH

Remarks: Left side shifted forward 1/4-inch.
Rear shifted left 1/8-inch.

30-Mile Road Test: No movement.

Panic Stops: No movement.

Pass 3, Course A: 6.00 SEC 5.68 MPH
Pass 3, Course B: 6.60 SEC 5.16 MPH

Remarks: Left side shifted forward 1/8-inch.
Rear shifted left 1/16-inch.

Pass 4, Course A: 6.00 SEC 5.68 MPH
Pass 4, Course B: 6.00 SEC 5.68 MPH

Remarks: No movement.

Washboard Course: No movement.

F. Synopsis of Test 5:

1. The H1572 kit was positioned with the long dimension perpendicular to the long dimension of the 22 1/2-ton M871 semitrailer. The kit was loaded near the rear of the truck and secured with two web strap tiedown assemblies crossed over the top of the container.

2. Displacement of the H1572 kit from its original starting point, as a result of the transportability testing, was a maximum of 2 inches during the test. The web strap remained taut throughout the test. This tiedown method is approved for on/off highway movement of the H1572 kit, package 2 of 2 for the M871 projectile.

Road Test Data for Test 5:

Date: 27 September 1990

Test Specimen: The H1572 kit was positioned with the long dimension perpendicular to the long dimension of the 22 1/2-ton M871 semitrailer and secured with two web strap assemblies crossed over the top of the container.

Pass 1, Course A: 6.00 SEC 5.68 MPH
Pass 1, Course B: 6.00 SEC 5.68 MPH

Remarks: Left side shifted back 1 1/2 inches.
Right side shifted back 1 1/8 inches, shifted right 1/8-inch.

Pass 2, Course A: 6.60 SEC 5.16 MPH
Pass 2, Course B: 6.60 SEC 5.16 MPH

Remarks: Left side shifted back 3/8-inch.
Right side shifted back 7/8-inch.

30-Mile Road Test: No additional movement.

Panic Stops: No additional movement.

Pass 3, Course A: 6.00 SEC 5.68 MPH
Pass 3, Course B: 6.60 SEC 5.16 MPH

Remarks: Left side shifted forward 1/4-inch.
Right side shifted forward 3/4-inch.

Pass 4, Course A: 6.00 SEC 5.68 MPH
Pass 4, Course B: 6.00 SEC 5.68 MPH

Remarks: Left side shifted forward 1/8-inch.

Washboard Course: No additional movement.

G. Synopsis of Test 6:

1. The H1572 kit was positioned with the long dimension perpendicular to the long dimension of the 22 1/2-ton M871 semitrailer. The kit was loaded near the rear of the truck and secured with one web strap tiedown assembly over the top of the container.

2. Displacement of the H1572 kit from its original starting point, as a result of the transportability testing, was a maximum of 1 1/4 inches during the test. The web strap remained taut throughout the test. This tiedown method is approved for on/off highway movement of the H1572 kit, package 2 of 2 for the M753 projectile.

Road Test Data for Test 6:

Date: 27 September 1990

Test Specimen: The H1572 kit was positioned with the long dimension perpendicular to the long dimension of the 22 1/2-ton M871 semitrailer and secured with one web strap tiedown assembly.

Pass 1, Course A: 6.00 SEC 5.68 MPH
Pass 1, Course B: 6.00 SEC 5.68 MPH

Remarks: Left side shifted back 1/4 inch.
Right side shifted forward 1/4 inch, shifted left 1/4 inch.

Pass 2, Course A: 6.60 SEC 5.68 MPH
Pass 2, Course B: 6.60 SEC 5.16 MPH

Remarks: Left side shifted forward 1/8 inch.
Right side shifted forward 1/8 inch, shifted right 3/4 inch.

30-Mile Road Test: Left side shifted rearward 1/8 inch.
Right side shifted rearward 1/8 inch.

Panic Stops:

5 MPH: No additional movement.

10 MPH: No additional movement.

15 MPH: Right side shifted forward 1/2 inch, shifted right 1/8 inch.

5 MPH Reverse: No additional movement.

Pass 3, Course A: 6.00 SEC 5.68 MPH
Pass 3, Course B: 6.60 SEC 5.68 MPH

Remarks: Left side shifted forward 1/4 inch (back to starting point).
Right side shifted rearward 1/4 inch, shifted right 1/8 inch.

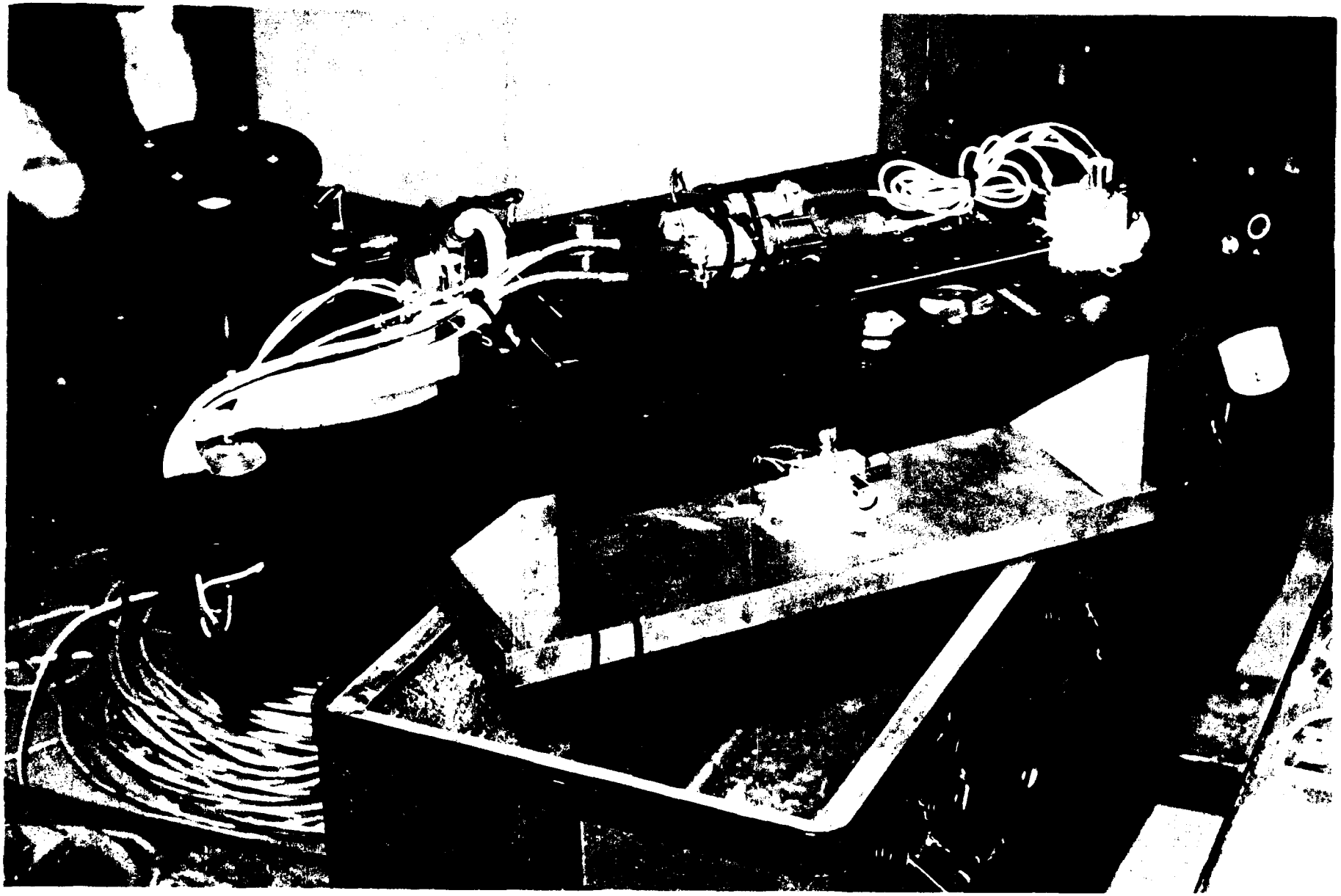
Pass 4, Course A: 6.00 SEC 5.68 MPH
Pass 4, Course B: 6.00 SEC 5.68 MPH

Remarks: Right side shifted rearward 1/8 inch, shifted right 1/4-inch (back to starting point).

Washboard Course: Left side shifted back 1-inch.
Right side shifted back 7/8-inch.

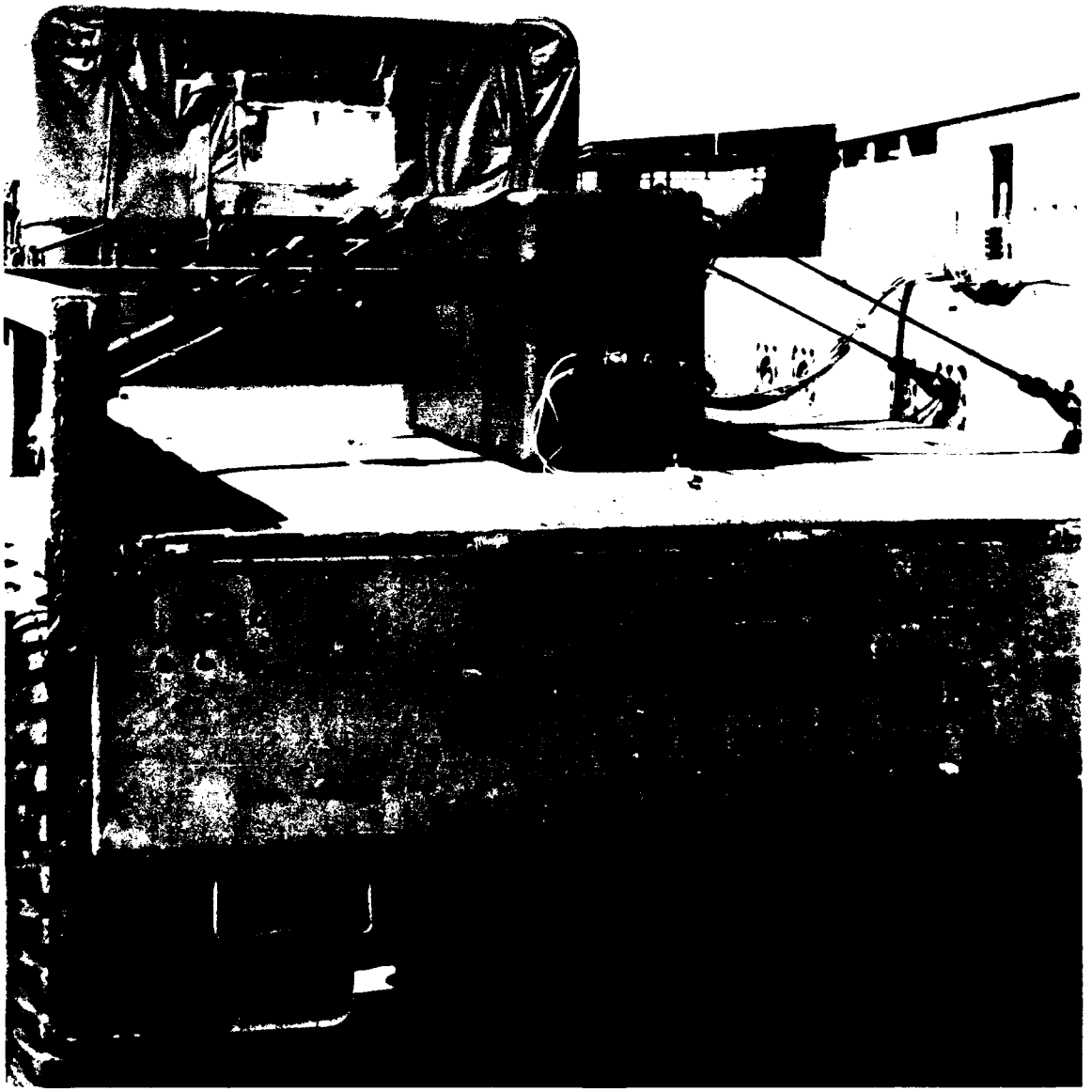
PART 5

PHOTOGRAPHS

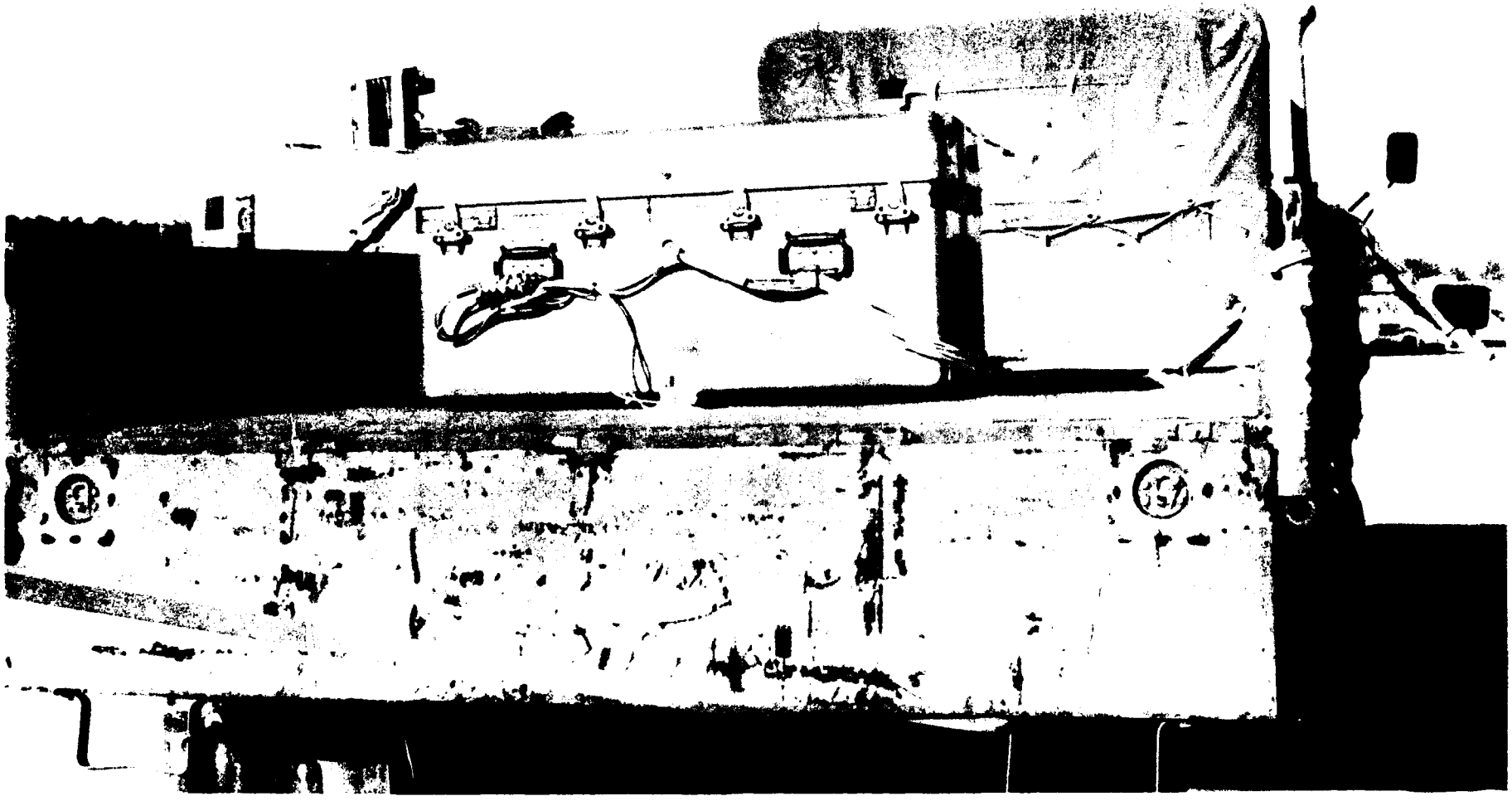


	U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL	
Photo No. AO317-SCN-90-6797. This photograph shows the placement of the three accelerometer blocks that were installed in the H1572 trainer.		

	U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL	
Photo No. AO317-SPN-90-420-6669. This photograph shows the 2 1/2-ton test truck and the chase vehicle which carried the instrumentation package.		



	U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL	
Photo No. AO317-SPN-90-420-6674. This photograph shows the H1572 kit in the longitudinal orientation on the 2 1/2-ton truck.		

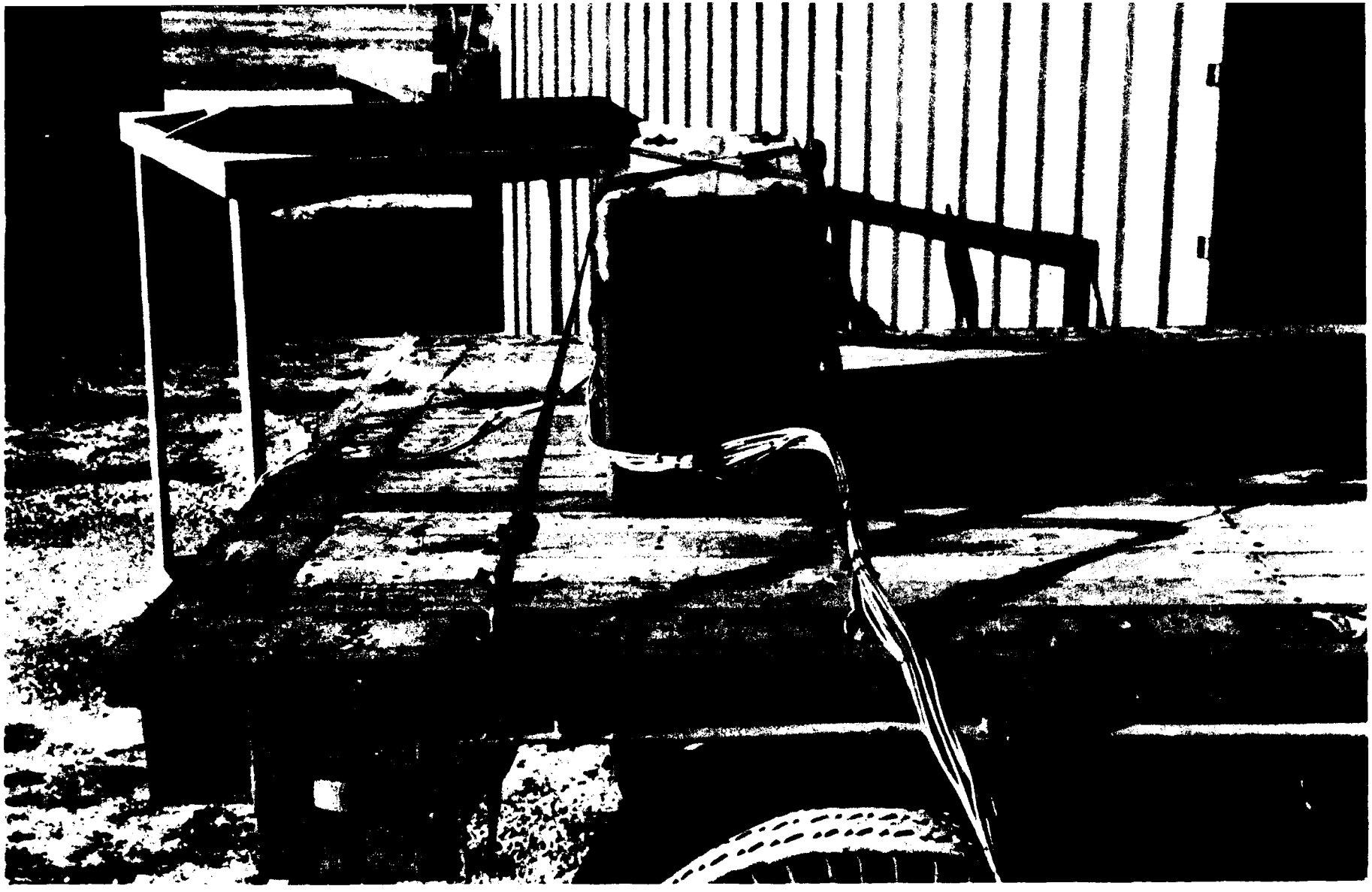


	U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL	
Photo No. AO317-SPN-90-420-6679. This photograph shows the H1572 kit in the lateral orientation secured with one web strap in the 2 1/2-ton truck.		

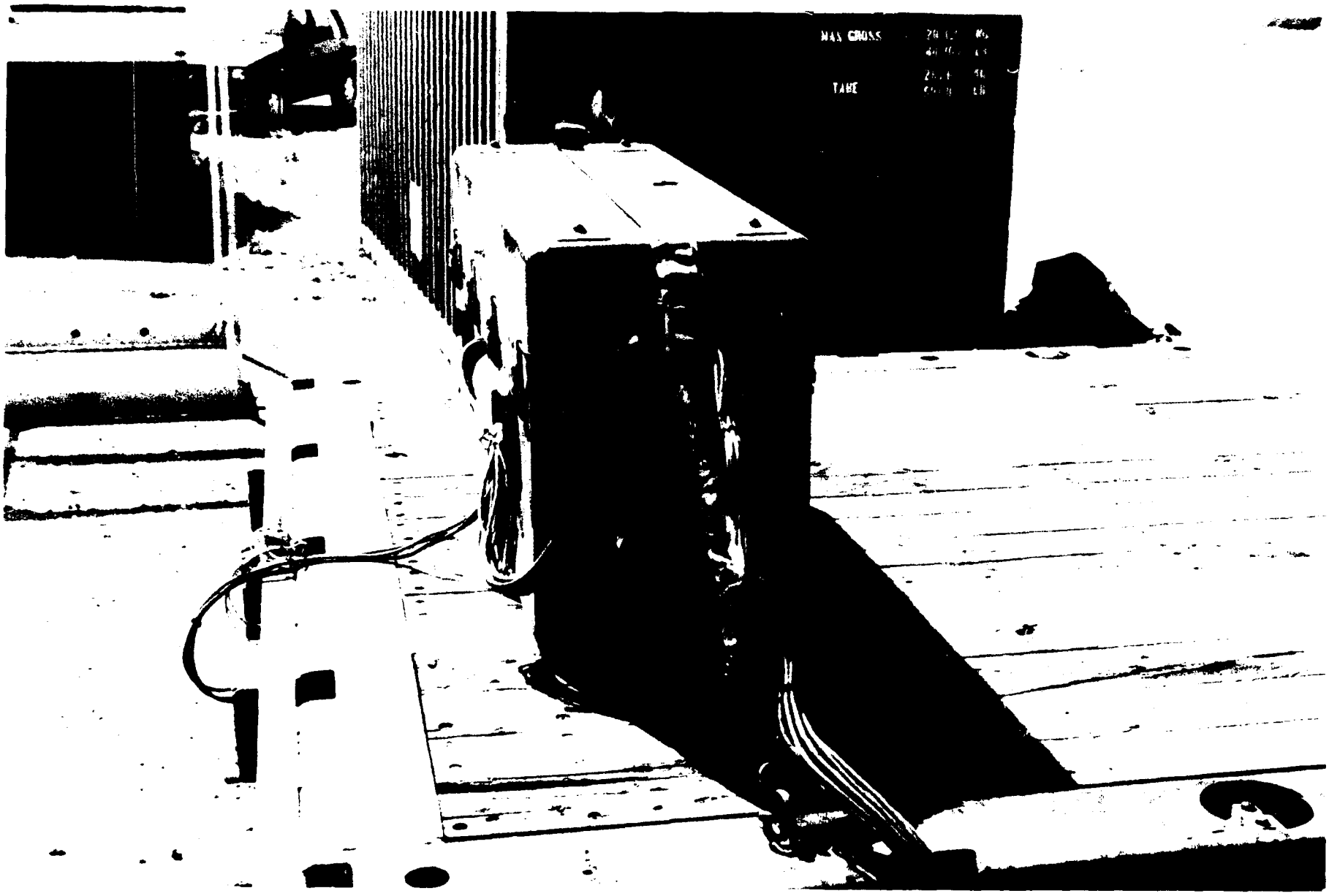
U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. AO317-SPN-90-420-6682. This photograph shows the H1572 kit in the lateral orientation secured with two web straps in the 2 1/2-ton truck.

	U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL	
Photo No. AO317-SPN-90-420-6686. This photograph shows the H1572 kit in the longitudinal orientation on the M871 semitrailer.		



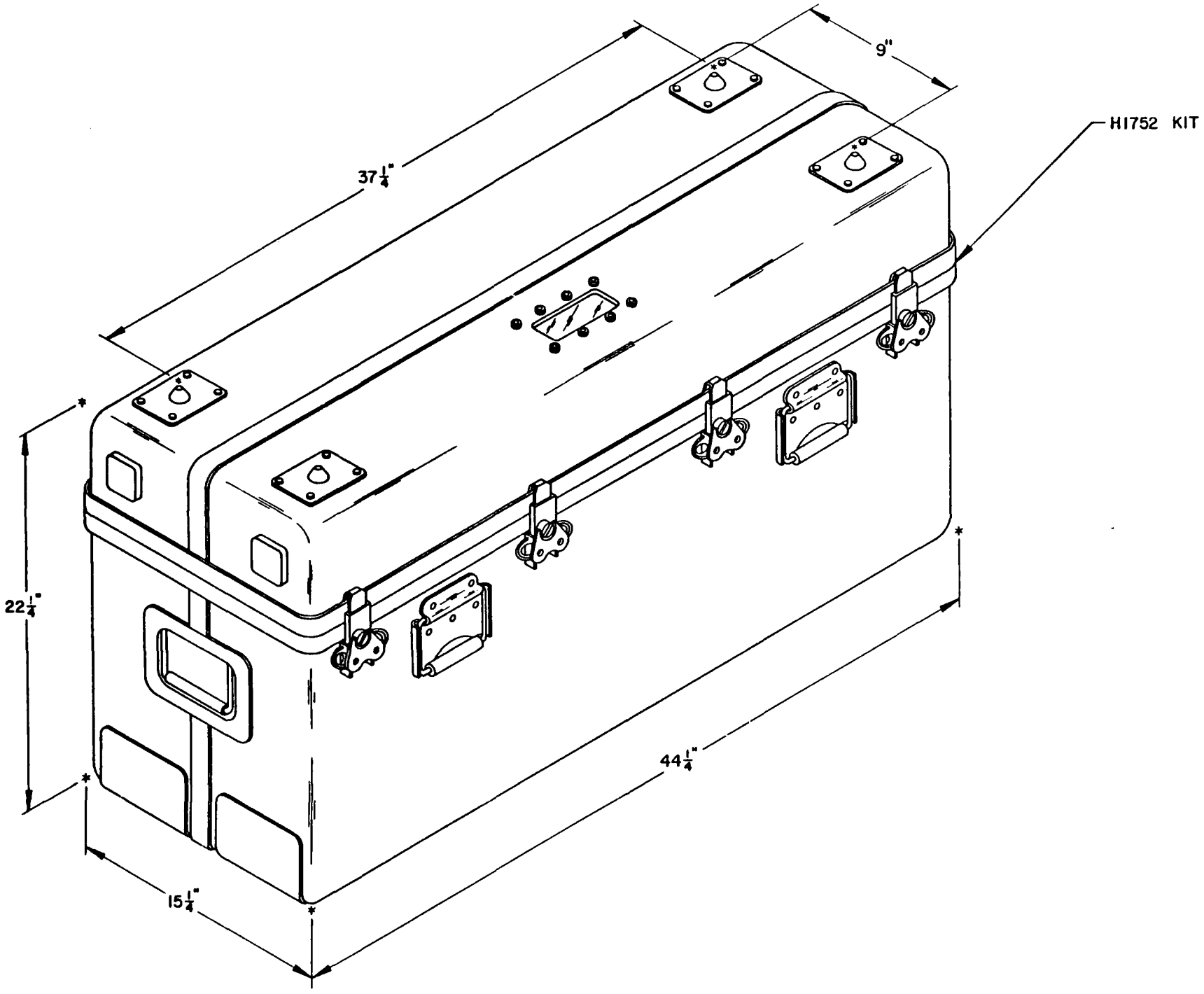
	U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL	
Photo No. AO317-SPN-90-420-6689. This photograph shows the H1572 kit in the lateral orientation secured with two web straps on the M871 semitrailer.		



	U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL	
Photo No AO317-SPN-90-420-6691. This photograph shows the H1572 kit in the lateral orientation secured with one web strap on the M871 semitrailer.		

PART 6

DRAWING


9"
37 1/4"
H1752 KIT
22 1/4"
44 1/4"
15 1/4"